Basic Symbols

Lines

- continuous line - flow line

- dashed line - pilot, drain

- envelope - long and short dashes around two or more component symbols.

Circular

- large circle - pump, motor

- small circle - measuring devices

- semi-circle - rotary actuator

Square

- one square - pressure control function

- two or three adjacent squares - directional control

Diamond

- diamond - fluid conditioner (filter, separator, lubricator, heat exchanger)

Miscellaneous Symbols

- Spring

- Flow

- Restriction
Hydraulic Schematic Symbols

Triangle

- solid - Direction of Hydraulic Fluid Flow
- open - Direction of Pneumatic flow

Pumps and Compressors

Fixed Displacement hydraulic pump

- unidirectional
- bidirectional

Variable displacement hydraulic pump

- unidirectional
- bidirectional

Compressor

Motors

Fixed displacement hydraulic motor

- unidirectional
- bidirectional
Variable displacement hydraulic motor

- unidirectional
- bidirectional

Pneumatic motor

- unidirectional
- bidirectional

Rotary Actuator

- hydraulic
- pneumatic

Cylinders

Single acting cylinder

- returned by external force
- returned by spring or extended by spring force

Double acting cylinders

- single piston rod (fluid required to extend and retract)
- double ended piston rod

Cylinders with cushions

- single fixed cushion
Hydraulic Schematic Symbols

- double fixed cushion
- single adjustable cushion
- double adjustable cushion

Directional Control Valves

Directional control valve (2 ports / 2 positions)

- Normally closed directional control valve with 2 ports and 2 finite positions.
- Normally open directional control valve with 2 ports and 2 finite positions.

Directional control valve (3 ports / 2 positions)

- Normally closed directional control valve with 3 ports and 2 finite positions.
- Normally open directional control valve with 3 ports and 2 finite positions.
Directional control valve (4 ports / 2 positions)
-Directional control valve with 4 ports and 2 finite positions

Directional control valve (4 ports / 3 positions)
-Directional control valve with 4 ports and 3 finite positions
*-(center position can have various flow paths)

Directional control valve (5 ports / 2 positions) Normally a pneumatic valve
-Directional control valve with 5 ports and 2 finite positions

Directional control valve (5 ports / 3 positions) Normally a pneumatic valve
-Directional control valve with 5 ports and 3 finite positions

Proportional directional control valve

Electro-hydraulic servo valve
-The spool positions on these valves is variable allowing for variable flow conditions.
Control Methods

Manual Control

- general symbol (without showing the control type)
- pushbutton
- lever
- foot pedal

Mechanical Control

- plunger or tracer
Hydraulic Schematic Symbols

- Spring
- Roller
- Roller (one direction only)

Electrical Control

- Solenoid (the one winding)

Pilot Operation

- Pneumatic
- Hydraulic

Pilot operated two-stage valve

- Pneumatic: Sol first stage
- Pneumatic: Air pilot second stage
- Hydraulic: Sol first stage
- Hydraulic: Hyd pilot second stage

Check valves, Shuttle valves, Rapid Exhaust valves

- Check valve
- Free flow one direction, blocked flow in other direction
-pilot operated check valve, pilot to close
-pilot operated check valve, pilot to open

**Shuttle valve**
-to isolate one part of a system from an alternate part of circuit.

**Rapid exhaust valve/Pneumatic**
-installed close to an actuator for rapid movement of the actuator.

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**Pressure Control Valves**

**Pressure Relief Valve(safety valve) normally closed**
- line pressure is limited to the setting of the valve, secondary part is directed to tank.

**Proportional Pressure Relief**
Hydraulic Schematic Symbols

Sequence Valve
- when the line pressure reaches the setting of the valve, valve opens permitting flow to the secondary port. The pilot must be externally drained to tank.
- pressure downstream of valve is limited to the setting of the valve

Pressure Reducing valve

Flow Control Valves

Throttle valve
- adjustable output flow

Flow Control valve
-with fixed output
  (variations in inlet pressure do not affect rate of flow)

-with fixed output and relief port to reservoir with relief for excess flow
  (variations in inlet pressure do not affect rate of flow)

-with variable output

-fixed orifice

-metered flow toward right free flow to left

-pressure compensated flow control
  fixed output flow regardless of load

-pressure and temperature compensated

-with variable output and relief port to reservoir

Flow dividing valve

-flow is divided equally to two outputs.
Hydraulic Schematic Symbols

### Shut-Off Valve

-Simplified symbol

### Accumulators

### Filters, Water Traps, Lubricators and Miscellaneous Apparatus

#### Filter or Strainer

#### Water Trap

-with manual drain

-with automatic drained

#### Filter with water trap

-with manual drain

-automtic drain

#### Air Dryer

refrigerant, or chemical removal of water from compressed air line

#### Lubricator
Hydraulic Schematic Symbols

Conditioning unit

- oil vapor is injected into air line

- compound symbol of filter, regulator, lubricator unit
- Simplified Symbol

Heat Exchangers

- air or water cooled unit designed to remove heat from oil returning to reservoir

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